PhD course 2025:
Advanced Energy Systems Analysis on the EnergyPLAN model

Again in the spring of 2025, Aalborg University, Denmark, hosts its annual EnergyPLAN PhD course. The course has been conducted every year since 2005. The course gives an introduction to advanced energy system analysis using the EnergyPLAN model. The course consists of onsite lectures taking place in Aalborg on 28 April - 1 May and online sessions on 6 May, 13 May and 20 May 2025. Once you have completed the course and passed the online exam, you will receive a course certificate. Registration and payment must be completed here before 7 April.

After the course the participants are expected to be able to understand methodologies of advanced energy system analysis and to be able to use the EnergyPLAN computer model as a tool in making energy system analysis.

The course is conducted as a combination of lectures and workshops of a total of 4 days (32 hours) and assignments of a total of 6-7 days (52 hours). Results of assignments will be presented by the participants.

Contents:
The course starts with an introduction to EnergyPLAN (installation, using, constructing new data sets) and proceeds to focus on the use of the model in
- sustainable cities and communities
- technical analyses of large-scale integration of wind.
- analyses of exchange with external electricity markets
- combinations of different renewable energy technologies.
- designing flexible energy systems using flexible technologies such as heat pumps, hydrogen storage, pumped storage etc.
- district heating systems versus individual houses and zero energy buildings
- designing energy systems based on multiple criteria

Organiser:	Professor Henrik Lund, e-mail: lund@plan.aau.dk
Lecturer(s):	Poul Alberg Østergaard, Henrik Lund, Jakob Zinck Thellufsen & Brian Vad Mathiesen
ECTS:	5
Time:	Onsite on 28 April—1 May and online on 6, 13 and 20 May 2025
Length:	5 days and assignments of 6-7 days (see above)
Place	In-person attendance at Aalborg University, Aalborg, Denmark followed by online Q&A sessions and online exam
Fee:	PhD fellows enrolled at a Danish university: Free PhD fellows enrolled at a university outside Denmark: 120 EUR Professionals (consultancy, industry, etc.): 1200 EUR
Registra-tion:	Registration until 7 April 2025 via this link. Registration is binding.
Payment:	Payment upon registration. **Credit card payment is required**.
Deadline:	7 April 2025

See Sustainable Energy Planning Research Projects here.

Preparations prior to the course

1. Install EnergyPLAN from energyplan.eu
2. Consider how you wish to use EnergyPLAN – preferably in your PhD project – alternatively in independent analyses only made for the PhD course (notice that this will be on the agenda for the first morning) - fill in form on Moodle (obligatory request to finalize enrollment).
3. Read the FIDE guide (Finding and inputting data to EnergyPLAN) from energyplan.eu and consider what data you will need to do 2.
4. There are a number of training exercises at energyplan.eu. You are expected to do these beforehand as this will enable you to make more advanced independent analyses during the actual course: https://www.energyplan.eu/training/exercises/
5. Read the articles
   a. EnergyPLAN – Advanced Analysis of Smart Energy Systems https://doi.org/10.1016/j.segy.2021.100007
   b. Reviewing EnergyPLAN simulations and performance indicator applications in EnergyPLAN simulations, http://dx.doi.org/10.1016/j.apenergy.2015.05.086
   c. Reviewing optimisation criteria for energy systems analyses of renewable energy integration, http://doi.org/10.1016/j.energy.2009.05.004
   d. Smart Energy Systems for coherent 100% renewable energy and transport solutions, http://doi.org/10.1016/j.apenergy.2015.01.075
   e. Smart energy Denmark. A consistent and detailed strategy for a fully decarbonized society https://doi.org/10.1016/j.rser.2022.112777
   f. Heat Roadmap Europe: Combining district heating with heat savings to decarbonise the EU energy system, http://doi.org/10.1016/j.enpol.2013.10.035
   g. A renewable energy scenario for Aalborg Municipality based on low-temperature geothermal heat, wind power and biomass, http://doi.org/10.1016/j.energy.2010.08.041
   h. Energy balancing and storage in climate-neutral smart energy systems https://doi.org/10.1016/j.rser.2024.115141

The course is conducted as a hand-on workshop based on each participant making an energy system analysis individually or in a group. The idea is to combine inspiration from lectures with work on your own analysis.
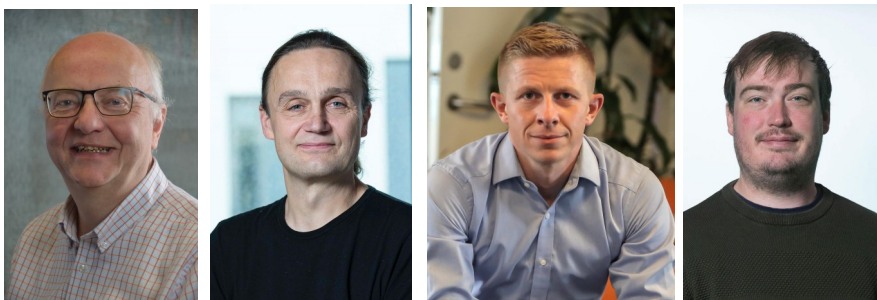
Lecturers: Henrik Lund, Poul Alberg Østergaard, Brian Vad Mathiesen and Jakob Zinck Thellufsen

Programme

Venue 28 April—1 May: Room 3.429, Aalborg University, Rendsburggade 14, DK-9000 Aalborg

	Monday 28 April 2025 (HL/JZT)	Tuesday 29 April 2025 (HL/PAØ)	Wednesday 30 April 2025 (HL/BVM/JZT)
09:00 - 12:00	**Introduction** *Welcome and programme* (HL) *Introduction to Energy System Analysis and EnergyPLAN* (HL) Participants' presentations of PhD projects and suggestions for energy system analysis - Part 1	**Study and scenario design** *Optimisation Criteria in high RE systems* (PAØ) Work on individual analyses Lecturers will be available	**Smart Energy Systems** *Smart Energy Systems integrating electricity, heat and transport systems* (BVM) Work on individual analyses Lecturers will be available
13:00 - 16:00	**How to get data and set up a model** *Setting up an EnergyPLAN model and finding the data* (JZT) *Simulation strategies in EnergyPLAN* (JZT) Participants' presentations of PhD projects and suggestions for energy system analysis - Part 2	**Workshop** Work on individual analyses Lecturers will be available	**Guest lecture and workshop** *Guest lecture Matteo Prina: EPLANopt and other multi-model approaches developed with EnergyPLAN* **Workshop** Work on individual analyses Lecturers will be available
18:00	**Dinner**		
	Thursday 1 May 2025 (HL/JZT)	**Tuesday 6 May and Tuesday 13 May – ONLINE**	**Tuesday 20 May 2025 - ONLINE (HL/PAØ/JZT)**
09:00 - 12:00	**Empirical cases** *Climate Neutral Scenario The IDA 70% CO2 reduction scenario using EnergyPLAN* (HL/JZT) Work on individual analyses Lecturers will be available		**Participant presentations (mandatory exam)** Online presentation of analyses and results followed by questions. 20 minutes per group/person. **Feedback on the course**
13:00 - 16:00	Work on individual analyses Lecturers will be available	**Q&A online sessions (optional)** Time will depend on participants' time zones. Likely 12:00-15:00 CET	